Perspectives & Passions:

An Interview with Sir Arvind Gupta

In conversation with a pioneer of thought, and master of innovation.

Arvind Gupta is an Indian science educator, toy inventor, author, translator, and scientist. On the eve of Republic Day, 2018, the Indian government awarded him the civilian award Padma Shree.

"Sir, from what we've read about you and found on the internet, we know that you were formerly an engineer in TELCO, which you then left to pursue the educational field through multiple mediums like television, books, toys, and more. Why did you feel the need to do this? What led to this change of heart, and why did you continue?"

The seed of this story was sown in my childhood. My parents never went to school, but I had an extremely loving and wise mother. Wisdom, you don't get through paper degrees; you learn it from real life struggles. She was a wise woman and wanted all her children to have the best education. I was the youngest of four children and we attended the best possible school - a convent school in my hometown of

U.P., Bareilly. Never in my life did my mother ask me to do my homework or study for the upcoming exams. Instead, I had a box where I would collect and tinker with small things, rubbish like matchboxes, cigarette packets—all junk. I would play alone for hours, and my mother never objected (chuckles), she said if this chap is happy, let him be. So it starts form there.

I was at IIT Kanpur from 1970-75. At IIT Kanpur, there was a strong Naxal movement, but we were never attracted by it. There was an on-campus school started by the faculty for the children of the poor, the mess servants, and cleaners etc. It was called the Opportunity School. For five years, some of us (the under graduate students) taught there. We used to go from room to room asking others to donate just five rupees. "Donate five rupees and help a child go to school." Some people slammed the door in our face, but others were kind and gave some money. This was my first experience with teaching.

IIT Kanpur, like many institutions, was built by displacing villages. My hostel was adjacent to the Nankari Village. I remember in my 4th, 5th year there would be a dozen boys in their 9th and 10th standard who would come to my room in the evening, and I would help them with Math, Science, English, Hindi, whatever they wanted. .

They cleared high school. This was one of my earliest experiences with teaching

Another incident occurred in my second year when I was 18 years old. I had the privilege of listening to a very inspiring person. His name was Dr. Anil Sadgopal, a molecular biologist who got his Ph.D. from Caltech. He left his job at the TIFR and moved to a village in Madhya Pradesh to start an NGO called Kishore Bharti, and they set up the Hoshangabad Science Teaching Program (HSTP), which became very famous. You have to understand, 50 years ago, there were no labs in village schools. All science was learnt by rote. Children mugged-up formulae, and then spat them out in exams. But children shouldn't be mugging; they should be doing things with their hands.
Professor Yash Pal, was a PhD from MIT and a scientist from TIFR. He later laid the foundation stone of IUCAA. He came as the first HSTP teacher trainer. The bureaucracy opposed this activity-based program because they couldn't relate to it. (chuckled throatily). It threatened them. But sometimes, in very backward areas, one finds some very progressive bureaucrats.

One such amazing bureaucrat was Dr. B.D. Sharma. He was the Education Secretary. He said to his lower minions, and his words should be etched in stone (eyes crinkling with laughter),

that the education standards in Madhya Pradesh were so low that these people could not worsen them.

I heard Dr. Sadgopal in 1972. Unlike many people who say, "Oh! We've done so much, spread out to so many schools, reached so many villages, so many millions." He said we've been trying for years but not achieved much. Once you're in a city, you have a very romantic image of a village. But once you actually go to a village, you encounter class, caste, and gender issues. The rich don't want the poor to go to school, (wry laughter) where will they get their cheap labor from? I said to myself that here was this man with sterling credentials, who left a good job and still not been able to do much. That became a big question for me. I wanted to find out what this ball game was? How does our society work?

In 1975, through a campus placement, I got a job in TELCO, Pune, and came to work here. The TELCO training was amazing, an engineer's dream, operating machines you had never worked at IIT. It was the first time you gained some practical experience of how real things work. It was great; I loved it. But after two years, I was placed on a mass production line and it became boring. I remembered Dr. Sadgopal so I wrote him a letter and he asked me to come over. TELCO would not grant me leave; they said if I wanted to go, I would have to quit my job. But then the TATA trust intervened. Tata Trust was at that time funding the science program, and that's how I got unpaid leave for a year. My job was secure; I could come back, but no pay during that time.

In 1978, I went to Kishore Bharti where the experiment to teach science to village children was going on. I thought we must use local, low-cost resources to make science interesting for children.

There was a weekly bazaar where the villagers went to buy their trinkets, mirrors, bangles etc. So, I decided to go to the "haat" and buy one specimen of everything that was being sold and see the possibilities of using them for learning. So, I bought one item of everything – matchboxes, mirrors, bangles one piece of every little thing. While I was getting my cycle inflated, I saw this cycle valve tube, which was 10 paise per foot in 1978. Just then, I had read a great book in the Kishore Bharti library written by a Cambridge trained physicist, Keith Warren. Keith was a traveling teacher and worked in many poor countries. He travelled to several villages and based on his experiences he wrote a small book. In this book he described the use of simple things like matchboxes for doing science experiments. Matchsticks were mass-produced in factories.

They conformed to certain standard dimensions. In 1978 matchboxes were not made of cardboard, but blue paper and thin wood. If you applied oil on the matchbox drawer it absorbed oil became waterproof. If you filled the drawer with water, it held about 20 ml of water. I was amazed, like wow! (fond chortle). After that my first month went into discovering the properties of the matchbox!! One day inadvertently a matchstick went snugly into the cycle valve tube. It was not by design, but by accident. Fiddly fingers you know? Just tinkering around to see, not with a set goal.

So, the first month, I made matchstick models, 2D – triangles, squares, pentagons, and 3D models, icosahedrons, and all the platonic solids. That made me truly happy. For the first time in my life, I thought I was using whatever little I had learnt to do something relevant. It gave me a high. I told myself this is so much better than making trucks.

I spent six months in Kishore Bharti designing more simple science experiments. After that I went to Trivandrum and worked with the famous architect Laurie Baker for 4 months. I held Baker in great esteem since my college days. After that, I returned to Pune. This internship gave me experience and helped me discover what I liked to do.

I continued working with TELCO for two more years, but this one-year exposure to the real world helped me set my goals of wanted I to do with my life. I quit TELCO in 1980.

I've been on the roads ever since, except for a small period at IUCAA. I've been privileged to visit over 3000 schools, written and translated books, and presented 125 programs for Doordarshan. The NCERT had a television wing the Central Institute for Education Technology (CIET). One of my teachers at IIT Kanpur Prof. Man Mohan Chaudhary became the joint director of the CIET – the TV wing of the NCERT. Because of his persuasion I ended up making more than 125 films, broadcast on Doordarshan. The program had a half-hour slot and the show was called Tarang. They had an in-house facility for dubbing these films into seven Indian languages. That gave me a sort of audience that I could have never imagined. Many of my progressive friends were very critical of me presenting films. They said I should continue to write books. I still write books, but TV was a totally different medium altogether. I could never reach so many people through books the way I could through television. Even now, I get a couple of letters every day which say, Sir, you are the Tarang person. I saw your programs in the '90s. This was obviously very nice. (laughs)"

"You emphasize a lot over 'localized' easily available materials for making toys, for making things. When we speak of innovation, there is this grandiose element to it, that it must be big for it to be truly creative, but clearly you do not think so. Can you please elaborate on your views along these lines?"

At that time there were no science labs in village schools. In a few good city schools, there were science labs. But over there all the apparatus was closeted and locked in cupboards, and if you looked carefully all the stuff was covered with a thin layer of dust because that apparatus was not meant for children, but to show-off to the school inspector. So, we thought of using simple material, low-cost, readily available, some of it throw away scrap material! We use old newspapers, magazines, plastic bottles, cartons, old pens etc. When science is taught with every day materials, it becomes magical. For example, using a newspaper, a staple of any household, children can fold 20 different kinds of caps which they can wear —a Gandhi topi, a Cricket Cap, a Captain's hat etc. Paper folding helps children learn concretely about geometry about angles and polygons that previously were only abstract words.

I wrote a book called Little Toys. The crux of the book was that tetra packs are bad for the environment. Tetrapaks are multi-walled laminates made by fusing layers of plastic, paper and aluminum. It is very difficult to separate these layers and to recycle them and so Tetrapaks are doomed to lie in some landfill for hundreds of years. Instead of drinking from Tetrapaks, pick one from the roadside and I will teach you how to make 50 toys! The book's aim was twofold: firstly, to inculcate some environmental awareness in children and secondly, to encourage children to think and make some wonderful toys with their own hands.

I worked in the Children's Science Center of IUCAA for 11 years (2003-2014).
My colleagues and I had laid down a few principles.

1. Our work should help the poorest kids not only in Pune, or Maharashtra, or Indian but in the whole world.
2. All our work would be accessible free to all children.
3. We will never sell any kits or toys.

So, every day we designed simple science experiments and toys. We small 2-minute short, crisp short videos titled TOYS FROM TRASH. We made videos of only those toys and experiments which we ourselves made and played with. In the end of each video, you will see a child playing

with the toy. Not us. Because the children are the true heroes and we must honor them.

We made around 1100 videos and dubbed them in 15 Indian languages. We uploaded them on Youtube to ensure a wider reach. Today, we have nearly 8700 videos in various languages, with a viewership of 11 crore! This was all possible, because we had the fortune of working with so many genuinely good people who graciously shared their ideas with us. We met and collaborated with many different people who enriched us with their ideas. The IUCAA science center was a fun place to be.

"Sir, from your words, it is clear to interpret that you think the Indian education system discourages creativity in students; it diminishes the spark, so to speak. Even in our department, we see that children who have crossed the baser education system rarely interact. So, the question that troubles me is: Can this spark, this curiosity, be revived again in college?"

See, you have to understand that the education system is not built to accommodate curious students. This happens through many means - requirement of rote learning for the purpose of spitting it out in exams or being silenced in class after asking questions.

The system is not kind to curious children. Despite the system, some children still persevere, but it is a very difficult task. Maybe at a college level there is a teacher who pays attention to all the students, and not just a select few.

Continued: Exactly, sir. This is the crux of my question. If such a kind and nurturing teacher is not available, can this be achieved by a student's efforts alone?

Answer: Now, this is a tough question you answer. See, I can only answer through my own experience (kind, old laugh). A few years ago, I was invited by The Times of India to write on Teacher's Day. They asked me to write about my favorite teacher.

My favorite teacher was a gentle, wonderful lady named Mrs. Frey. I had opted for advanced math in school, and Mrs. Frey was our math teacher. We used to sit in this in the corridor that had a table and 4 chairs.

Early on, Mrs. Frey told us that she was not that great at math and we would have to figure out a lot of Math by ourselves. Quickly, she realized that while I was quite good in math, I was poor at English. So, she conversed with me for hours in English. She was patient, attentive, and that did wonders to my confidence. I dreaded my English teacher as she was a very strict, woman. But I loved Mrs. Frey. So, that is the influence of a great teacher.

She gave me self-worth, and self-confidence. The result was that I excelled in Math but also passed the English exam with distinctions!

In relation to this, there is also a very famous experiment conducted in the '70s, published in a book called 'Pygmalion in the Classroom.' This scientist, Robert Rosenthal, gave two groups of six children guinea pigs. He tasked the children to teach the guinea pigs how to negotiate a maze and return after 15 days. He discreetly mentioned to one group that their pigs were slightly dumb, and to the other group, he said their pigs were extremely intelligent. The result was that the intelligent group's guinea pigs could easily finish the maze, while the guinea pigs from the dump group did not even start.

Soon he extended this experiment to humans. In a suburb of Chicago, he went to this school where most of the children were disadvantaged and came from migrant families – Mexicans, Afro-Americans etc. Rosenthal picked the attendance sheet and randomly ticked the children's as "clever" or "dumb". Then he told the teachers, "These are the smart children, these are not so cleaver the dumb ones," and so on. All this was completely random, mind you. Every three months, Rosenthal gave the children a standard IQ test, and the results were startling. The students who were marked dumb actually deteriorated, while those branded "smart" progressed. This was because the teachers' behavior towards the children had changed—they had started paying less attention to those who were the so-called 'dumb.'

"In further relation, sir, the culture of questioning and curiosity is being killed, not just through the education system but also through societal normalization. When we question, we are subjected to endless scowling and glares. We can say that curiosity and questioning are the building blocks of innovation. Do you think that suppressing curiosity is, in a way, denying people their individuality?"

Our society leans towards rote memorization as the foundation for learning. Whether it be our verses, mantras, or math tables that we memorize. Children are taught not ask too many questions because it undermines the authority of the teacher. But a great teacher comes down to the level of the child, because no one the world is a know-all. The best teachers search for the right answers along with their students. That's the spirit of a great teacher—one who doesn't flaunt his/her degrees but empathizes and learns along with the students.

"Sir, despite your advanced age, how do you keep yourself motivated?"

In our country there is still so much 'to do'. During my stay in New Delhi, I was an advisor to the National Book Trust. That exposed me to poverty of children's literature in Hindi. In Maharashtra we don't see so many of these problems because it is a much more progressive state. In terms of Human Development Index – the large Hindi states like UP, Bihar, Rajasthan, MP are the most backward "Bimaru" states. The educational terrain is barren and rocky. Even if there was a good seed, it will wilt away because of lack of nutrition and nurturance. So, my work is to create a fistful of soil every day.

I left IUCAA in 2014, with a mandate—to translate at least one children's book every day. There are so many learners in our country and our humble task is to make good books available to them. Scanning and translating books keeps me going.

"**To wrap up, sir, we have a final question. Could you please advise the students of our department on how to imbibe innovation into their life?"**

Never run after fame or success—these are all tawdry things. Take up work that is meaningful, that makes you happy, that exhilarates and excites you. The worth of your work should fill you with deep satisfaction. Success will chase you because you will have lived this life fully. Never live stale dreams of others. Live your own dreams. You have a right to do so. So, live your dreams. Life is too short for anything else.

Pop- Up Trivia

I speak without a mouth and hear without ears.
I have no body, but I come alive with the wind.
What am I?